CLAIMS

1. A planarizing machine for processing microelectronic substrate assemblies, comprising:

a table;

a fluid container on the table;

an elastic membrane over the fluid container, the membrane having a first surface engaging a portion of the fluid container to define a fluid chamber between an interior portion of the first surface of the membrane and the fluid container and a second surface facing away from the fluid chamber, and the membrane being coupled to the fluid container to flex the first and second surfaces toward the fluid chamber; and

a planarizing medium having a planarizing surface facing away from the elastic membrane and an under surface coupled to the second surface of the membrane, the planarizing medium and the membrane being sufficiently flexible to flex the planarizing and under surfaces of the planarizing medium toward the fluid chamber in a local area under a microelectronic substrate pressed against the planarizing medium to provide at least a substantially uniform pressure between the substrate and the planarizing surface across the substrate.

2. The planarizing machine of claim 1 wherein the planarizing medium is bonded directly to the membrane, the planarizing medium and the membrane flexing in unison in a local flex zone under the substrate.

3. The planarizing machine of claim 2 wherein the planarizing medium comprises a polishing pad, and the polishing pad is bonded directly to the membrane.

4. The planarizing medium of claim 2 wherein the planarizing medium comprises a polishing pad coupled to an under-pad, and the under-pad is bonded directly to the membrane.

5. The planarizing machine of claim 1 wherein:

the fluid container comprises a basin with a bottom section and a sidewall projecting from the bottom section to a rim to define a cavity;

the membrane comprises a rubber sheet; and

the planarizing machine further comprises a retaining member releasably attached to the fluid container to clamp a perimeter portion of the membrane to the rim of the sidewall.

6. The planarizing machine of claim 5 wherein the basin is an integral portion of the table, the bottom section and the sidewall of the basin forming a depression in the table.

7. The planarizing machine of claim 5 wherein the basin is a separate component from the table, the bottom section of the basin being attached to a surface of the table.

8. The planarizing machine of claim 5 wherein the planarizing medium comprises a polishing pad, the polishing pad being bonded directly to the rubber sheet to flex together in unison.

9. The planarizing machine of claim 5 wherein the planarizing medium comprises a polishing pad coupled to an under-pad, the under-pad being bonded directly to the rubber sheet to flex together in unison.

10. The planarizing machine of claim 5, further comprising support fluid filling the fluid chamber to support the membrane.

11. The planarizing machine of claim 10 wherein the support fluid comprises glycerin.

12. The planarizing machine of claim 10 wherein the support fluid comprises liquid water.

13. The planarizing machine of claim 10 wherein the support fluid comprises air.

14. The planarizing machine of claim 1 wherein fluid container is a bladder attached to the table, the bladder having a bottom section attached to the table and a sidewall projecting from the bottom section, and the membrane being a top portion of the bladder integral with the sidewall, the bottom section, the sidewall, and the elastic membrane defining an enclosed fluid chamber in the bladder.

15. The planarizing machine of claim 14 wherein the elastic membrane of the bladder is a rubber sheet.

16. The planarizing machine of claim 15, further comprising a support fluid in the fluid chamber to support the elastic membrane.

17. The planarizing machine of claim 16 wherein the support fluid comprises liquid water.

18. The planarizing machine of claim 16 wherein the support fluid comprises glycerin.

19. The planarizing machine of claim 16 wherein the support fluid comprises air.

20. A planarizing machine for planarizing microelectronic substrates, comprising:

a table;

a fluid container on the table, the fluid container having an inner surface defining a cavity and a rim around at least a portion of the inner surface;

a flexible, elastic membrane coupled to the rim, the membrane having an interior surface facing the inner surface of the fluid container to define a fluid chamber, and the membrane having an exterior surface facing away from the fluid chamber; and

a planarizing medium bonded to the exterior surface of the membrane, the planarizing medium and the membrane flexing together into the fluid chamber to at least substantially conform to a curvature of a microelectronic substrate pressed against the planarizing medium.

21. The planarizing machine of claim 20 wherein the planarizing medium comprises a polishing pad, and the polishing pad is bonded directly to the membrane.

22. The planarizing machine of claim 20 wherein the planarizing machine comprises a polishing pad coupled to an under-pad, and the under-pad is bonded directly to the membrane.

23. The planarizing machine of claim 20 wherein the membrane comprises a non-perforated sheet.

24. The planarizing machine of claim 23 wherein:

the fluid container comprises a sidewall projecting from the table, the rim being an upper edge of the sidewall, and the inner surface being defined by the sidewall and an upper surface of the table;

the membrane comprises a rubber sheet; and

the planarizing machine further comprises a retaining member attached to the sidewall to clamp a perimeter portion of the membrane against the rim.

25. The planarizing machine of claim 24, further comprising a support fluid in the fluid chamber, wherein the support fluid comprises liquid water.

26. The planarizing machine of claim 24, further comprising a support fluid in the fluid chamber, wherein the support fluid comprises glycerin.

27. The planarizing machine of claim 20 wherein the fluid container comprises a bladder, the bladder including a bottom section attached to the table and a sidewall projecting from the bottom section, and wherein the membrane is attached to the sidewall to define a fluid chamber in the bladder in a space between the bottom section and the elastic membrane.

28. The planarizing machine of claim 27, further comprising a support fluid in the fluid chamber, wherein the support fluid comprises liquid water.

29. The planarizing machine of claim 27, further comprising a support fluid in the fluid chamber, wherein the support fluid comprises glycerin.

30. The planarizing machine of claim 27, further comprising a support fluid in the fluid chamber, wherein the support fluid comprises air.

31. A planarizing machine for planarizing a microelectronic substrate, comprising:

a table having a surface, a sidewall projecting from the surface to define a depression on the table, and a rim at an end of the sidewall;

a non-perforated elastic membrane having an interior surface facing the depression and an exterior surface facing away from the depression, and the

membrane being coupled to the rim to form a sealed fluid chamber between the depression and the interior surface of the membrane;

a support fluid filling the fluid chamber; and

a planarizing medium coupled to the membrane, the planarizing medium and the membrane flexing into the fluid chamber against the support fluid to at least substantially conform to a curvature of a microelectronic substrate pressed against the planarizing medium.

32. The planarizing machine of claim 31 wherein the planarizing medium comprises a polishing pad, and the polishing pad is bonded directly to the membrane.

33. The planarizing machine of claim 31 wherein the planarizing machine comprises a polishing pad coupled to an under-pad, and the under-pad is bonded directly to the membrane.

34. The planarizing machine of claim 31 wherein the support fluid comprises water.

35. The planarizing machine of claim 31 wherein the support fluid comprises glycerin.

36. A planarizing machine for planarizing a microelectronic substrate, comprising:

a table having a surface, a sidewall projecting from the surface to define a depression on the table, and a rim at the end of the sidewall;

an elastic membrane having an interior surface facing the depression and an exterior surface facing away from the depression, and the membrane being coupled to the rim to form a sealed fluid chamber between the depression and the interior surface of the membrane;

a support fluid filling the fluid chamber; and

a planarizing medium bonded to the membrane, the planarizing medium and the membrane flexing against the support fluid into the fluid chamber to at least substantially conform to a curvature of a microelectronic substrate pressed against the planarizing medium.

37. The planarizing machine of claim 36 wherein the membrane comprises a non-perforated sheet.

38. The planarizing machine of claim 36 wherein the planarizing medium comprises a polishing pad, and the polishing pad is bonded directly to the membrane.

39. The planarizing machine of claim 36 wherein the planarizing machine comprises a polishing pad coupled to an under-pad, and the under-pad is bonded directly to the membrane.

40. The planarizing machine of claim 36 wherein the support fluid comprises water.

41. The planarizing machine of claim 36 wherein the support fluid comprises glycerin.

42. A planarizing apparatus for use in a planarizing machine for microelectronic devices, comprising:

a pad support assembly having a bottom section configured to be attached to a table of the planarizing machine, a sidewall projecting from the bottom section, an elastic membrane coupled to the sidewall to define an enclosed fluid chamber, the bottom section, the sidewall and the elastic membrane being an integral component defining a bladder;

a support fluid in the fluid chamber; and

a planarizing medium coupled to the elastic membrane, the planarizing medium and the elastic membrane flexing in a local flex zone under a substrate pressed against the planarizing medium to provide at least a substantially uniform pressure distribution across the substrate.

43. The planarizing apparatus of claim 42 wherein the support fluid comprises water.

44. The planarizing apparatus of claim 42 wherein the support fluid comprises glycerin.

45. The planarizing apparatus of claim 42 wherein the support fluid comprises air.

46. In the fabrication of microelectronic substrates, a method of planarizing a microelectronic substrate, comprising:

removing material from a surface of the substrate by contacting the substrate with a planarizing surface of a planarizing medium and moving the substrate with respect to the planarizing surface; and

flexing portions of the planarizing medium under the substrate as the substrate moves across the planarizing medium to continuously conform a local flex zone on the planarizing medium to a global curvature across the substrate and provide at least a substantially uniform pressure distribution across the substrate.

47. The method of claim 46 wherein the planarizing medium is bonded directly to an elastic membrane and the elastic membrane is attached to a fluid container to define a fluid chamber filled with a support fluid, and wherein flexing the planarizing medium comprises flexing the local flex zone in the planarizing medium and the elastic membrane in unison.

48. The method of claim 47, further comprising filling the fluid chamber with water.

49. The method of claim 47, further comprising filling the fluid chamber with glycerin.

50. The method of claim 46, further comprising bonding the planarizing medium directly to a non-perforated elastic membrane, the elastic membrane being coupled to a fluid container to define a fluid chamber filled with a support fluid.

51. The method of claim 50, further comprising filling the fluid chamber with water.

52. The method of claim 51 wherein filling the fluid chamber with water comprises pressurizing the water within the fluid chamber to a pressure of approximately 0.25 psi to 10 psi.

53. The method of claim 50, further comprising filling the fluid chamber with a liquid having a viscosity greater than water.

54. In the fabrication of microelectronic substrates, a method of planarizing a microelectronic substrate, comprising:

pressing a surface of the substrate against a planarizing surface of a planarizing medium bonded to an elastic membrane, the membrane being attached to a fluid container to define a fluid chamber filled with a support fluid;

moving at least one of the substrate or the planarizing medium with respect to the other; and

flexing portions of the planarizing medium and the elastic membrane in a local flex zone under the substrate as the substrate moves across the planarizing

medium to continuously conform the portions of the planarizing medium in the local flex zone to a global curvature across the substrate.

55. The method of claim 54 wherein flexing the portions of the planarizing medium comprises flexing the portions of the planarizing medium and the elastic member in the local flex zone in unison.

56. The method of claim 55, further comprising filling the fluid chamber with water.

57. The method of claim 55, further comprising filling the fluid chamber with glycerin.

58. The method of claim 54, further comprising bonding the planarizing medium directly to a non-perforated elastic membrane.

59. The method of claim 58, further comprising filling the fluid chamber with water.

60. The method of claim 59 wherein filling the fluid chamber with water comprises pressurizing the water within the fluid chamber to a pressure of approximately 0.25 psi to 10 psi.

61. The method of claim 58, further comprising filling the fluid chamber with a fluid having a viscosity greater than water.